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ERTS Program Manager
Code ER
NASA Headquarters
Washington, D. C. 20546

RE: Contract No. NAS5-21795 GFSC ID ST 355

Gentlemen:

The Indiana Geological Survey and Earth Satellite Corporation (EarthSat) are pleased to submit a progress report for the period of July 1, 1973 to September 1, 1973. To facilitate, for review by NASA, a consistent summary format has been adopted for month-to-month reporting.

A. TITLE: Study of Application of ERTS-A Imagery to Fracture-Related Mine Safety Hazards in the Coal Mining Industry

B. PRINCIPAL INVESTIGATOR: Dr. Charles E. Wier (SR #325)
(Indiana geological survey)

C. CO-PRINCIPAL INVESTIGATOR: Dr. Frank J. Wobber

D. PRINCIPAL CONTRIBUTORS:
Dr. Charles E. Wier
Dr. Frank J. Wobber
Mr. Orville R. Russell
Mr. Roger V. Amato
Mr. Thomas Leshendok

E. SUMMARY OF ACCOMPLISHMENTS:

° A four-day field trip was made in southwestern Indiana to conduct discussions with underground mine operators, make examinations of roof falls in an underground mine, make

examinationsof fractures and joints, and conduct an aerial reconnaissance flight for fracture validation.

- Preliminary mine hazards prediction maps were prepared and used in discussions with mine operators. These maps served to generate operator views on the validity of data, technique of presentation and utility to the mining community. The operators were most cooperative in supplying information and ideas on the occurrence and prevention of mine roof falls.

- Multispectral imagery from the March 28th C130B underflight (Mission 230) was received in late August. Preliminary analysis suggests that the data has limited application for fracture mapping. The near infrared bands, particularly at 1.2μm - 1.3μm wavelengths appear to be excellent for mine subsidence detection under the conditions existing at the time of data acquisition, i.e., ground that is highly saturated with water from heavy rainfalls.

- Visits were made to the Old Ben Coal Company and Amax Coal Company main offices to obtain their views on the program.

- A series of illustrations (35mm slides), depicting various applications of ERTS data to mine reclamation, mine safety and mined land inventory, were prepared at NASA's request for Senator Frank Moss for various briefings.

F. SIGNIFICANT RESULTS:

The Kings Station Mine in Gibson County, Indiana has experienced considerable roof fall problems. Detailed fracture mapping of the mine area was done with ERTS and aircraft imagery, and a prediction map of roof problem areas was produced in advance of a visit. The visit to the mine and discussions with the operator indicated that of four zones mapped as potential problem areas, three coincided with areas of excessive roof fall. This positive correlation of 75% lends confidence to the validity of the technique being applied in the investigation. The mine officials expressed an interest in the project and are anxious to see the final product maps which are forthcoming.

G. RECOMMENDATIONS FOR TECHNICAL CHANGES:

The development of a valid technique for predicting zones of potential roof fall in underground coal mining is of great significance for mine safety and should be investigated in depth. It is recommended that the techniques being applied in the current investigation be further tested in other coal producing areas of different geological settings. A number of mine sites in various parts of the United States are being evaluated for suitability for such studies.

H. PROBLEMS:

Delivery of ERTS prints has been unusually slow during this reporting period. This is creating delays in progress in that prints are an integral part of the analysis program, and budgeting limitations will not permit commercial printing.

If this situation continues as the investigation nears contract termination, a serious problem will develop in scheduling image analysis; cost increases in the ERTS data evaluation will be likely. A response to our requests for additional funding (add-ons for expanded avenues of investigation) are needed to adequately complete important work at minimum cost. Because numerous letter requests to the National Coal Association have brought no replies, the continuing involvement of the Association in our work is open to question. This may reduce the effectiveness of the Coal Industry Seminar.

I. CHANGES TO STANDING ORDER FORMS:

None.

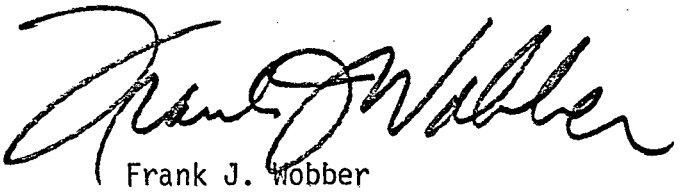
J. OVERVIEW OF INVESTIGATION:

During the last reporting period, analysis of all of the underflight data, with the exception of the multispectral scanner, was completed. Predictive mining hazards maps were prepared, and the utility and format of the maps were discussed with mine operators in the field. The validity of the maps was checked by correlation with roof fall problem areas within the mines. A positive correlation of about 75% was shown.

During the next reporting period, the 1:250,000 scale fracture maps of the Indiana portion of the Eastern Interior Coal Basin will be completed with the exception of data from forthcoming ERTS imagery. Presentation techniques for the mine hazards maps will be finalized, and drafts of the detailed (1:24,000) mine sites will be made.

Personal contacts with a portion of the mining companies have been established and discussions started concerning a seminar on the applications of remote sensing to various problems of the mining industry.

Sincerely yours,



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FJW:cn